

FIG. 1

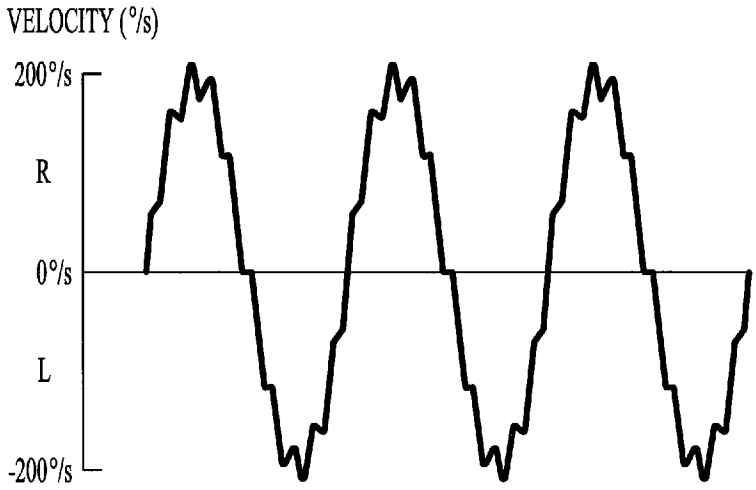


FIG. 2

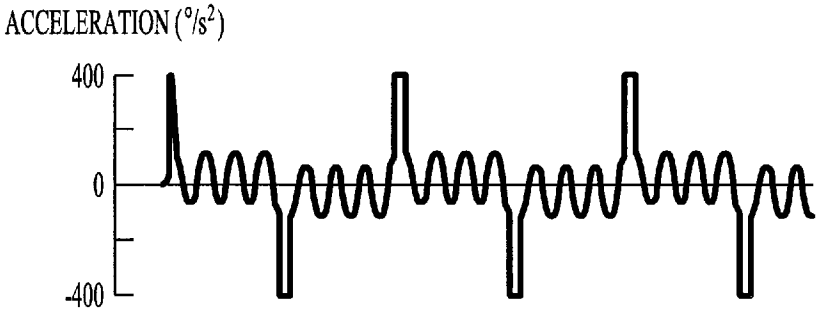


FIG. 3A

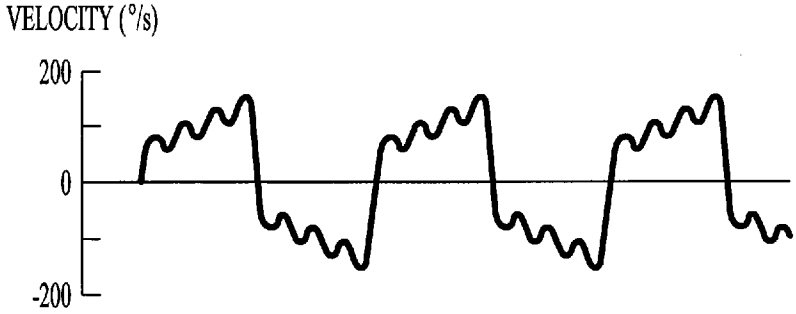


FIG. 3B

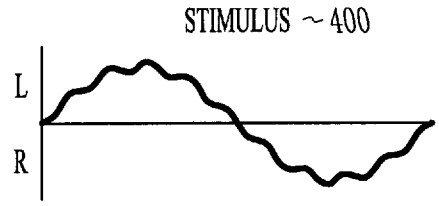


FIG. 4A

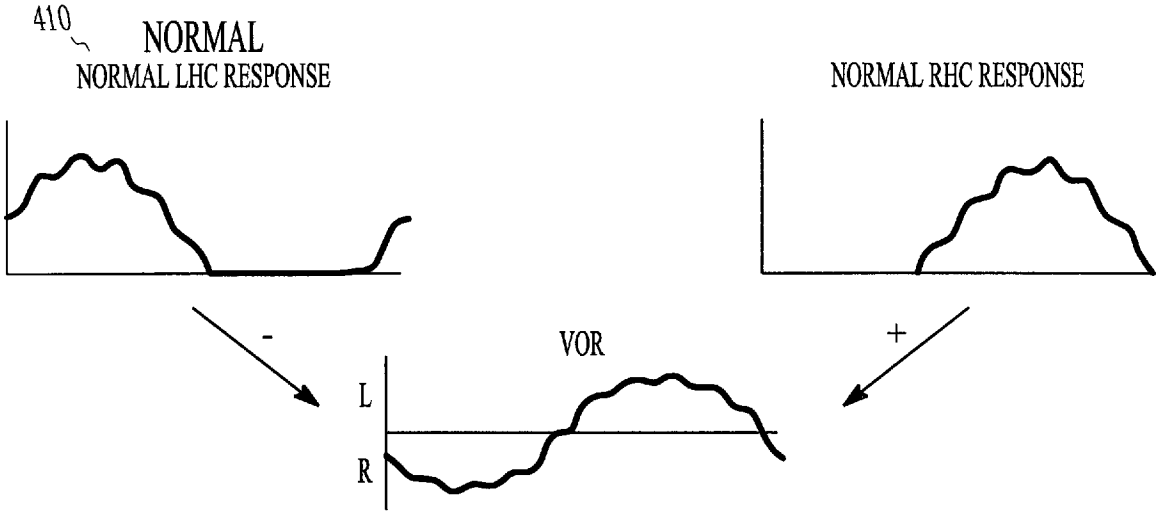


FIG. 4B

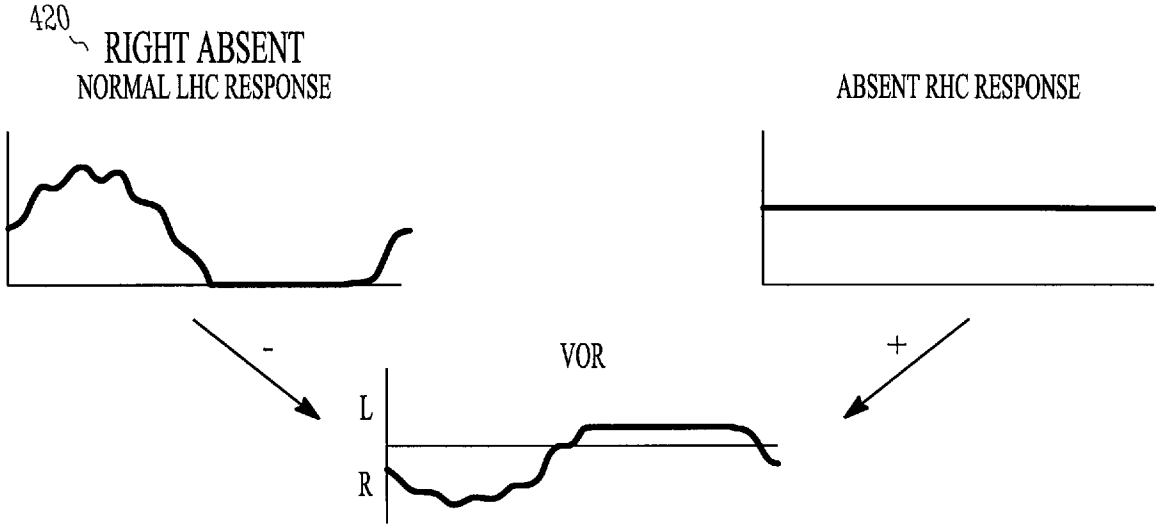


FIG. 4C

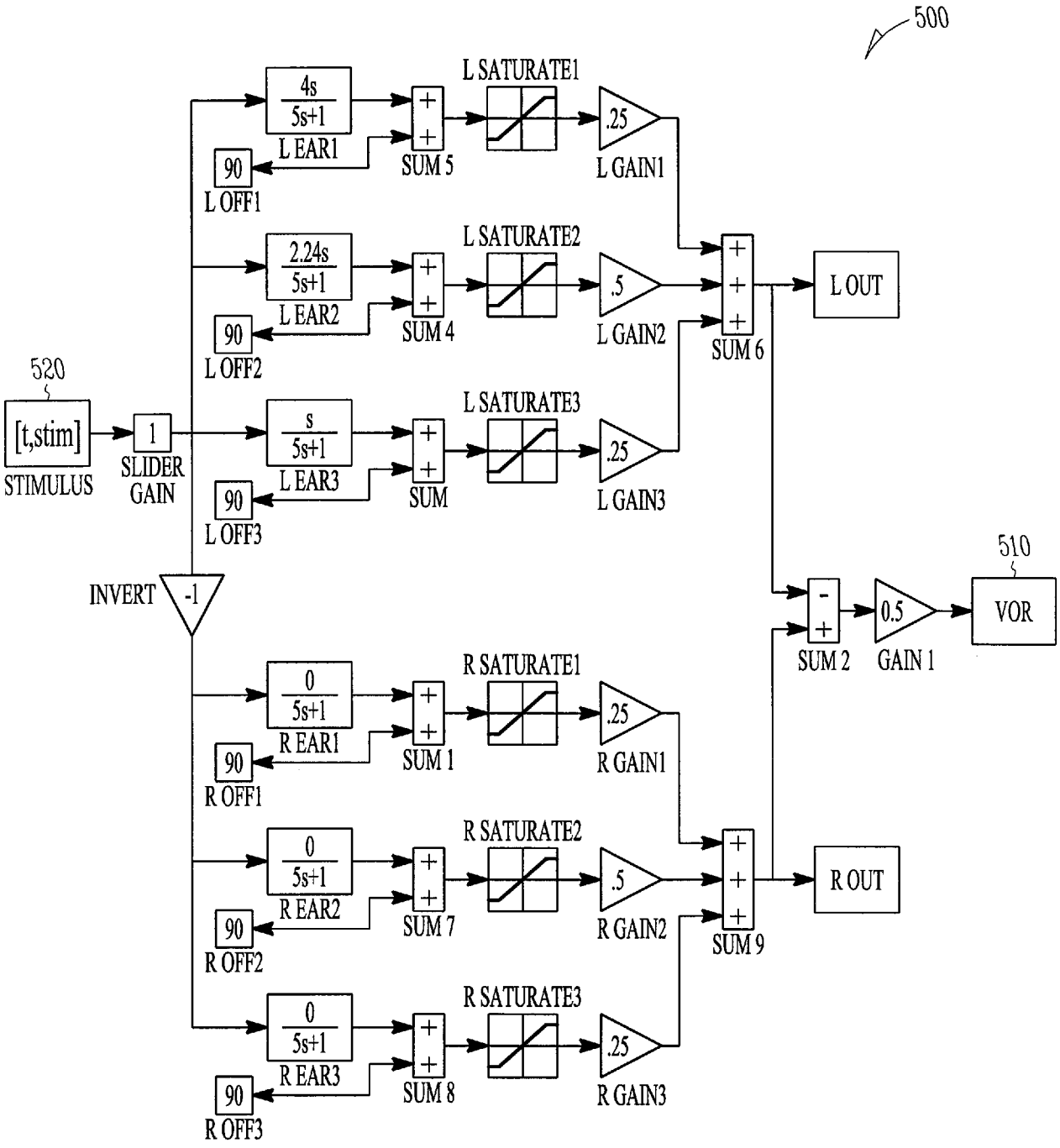
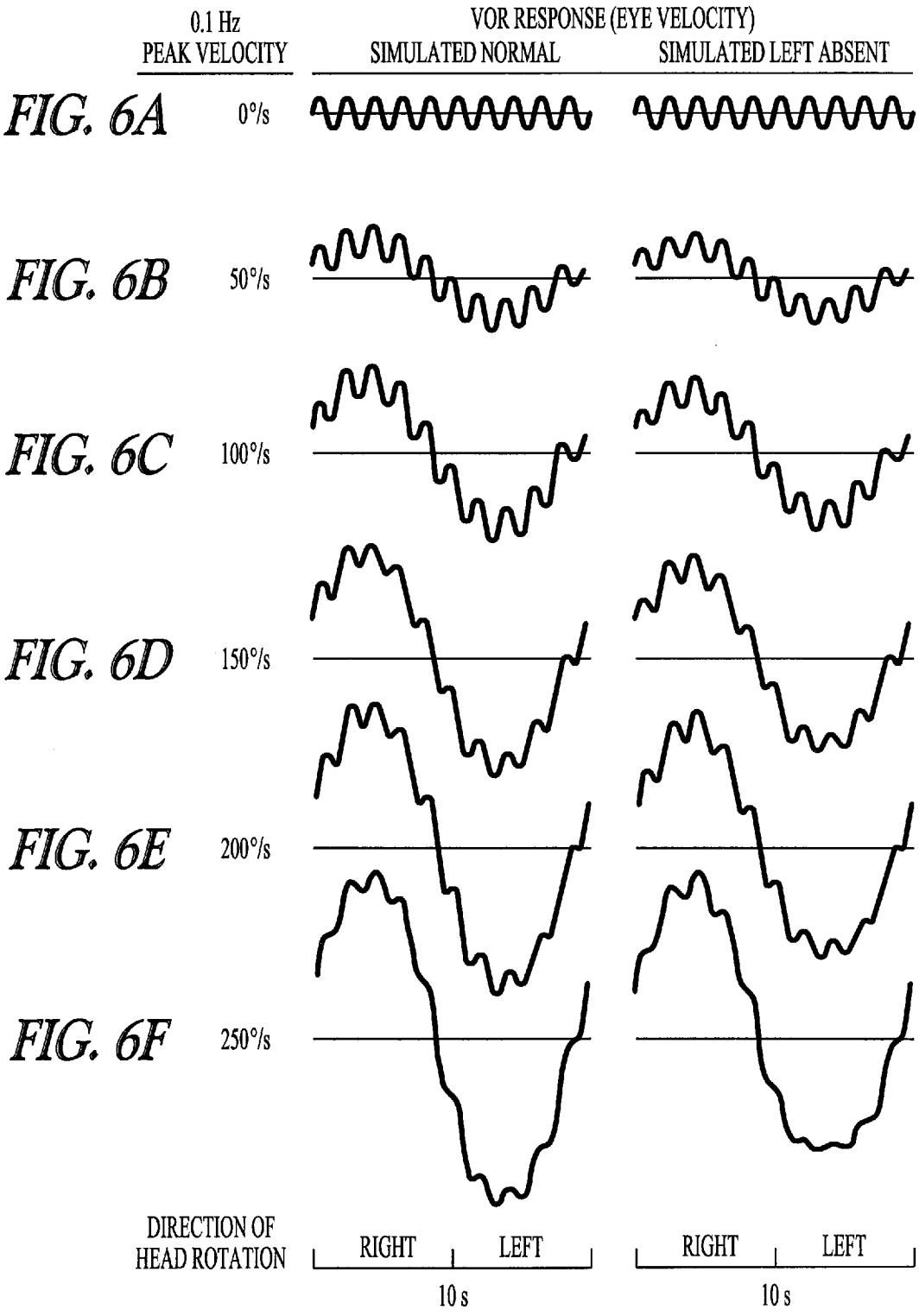
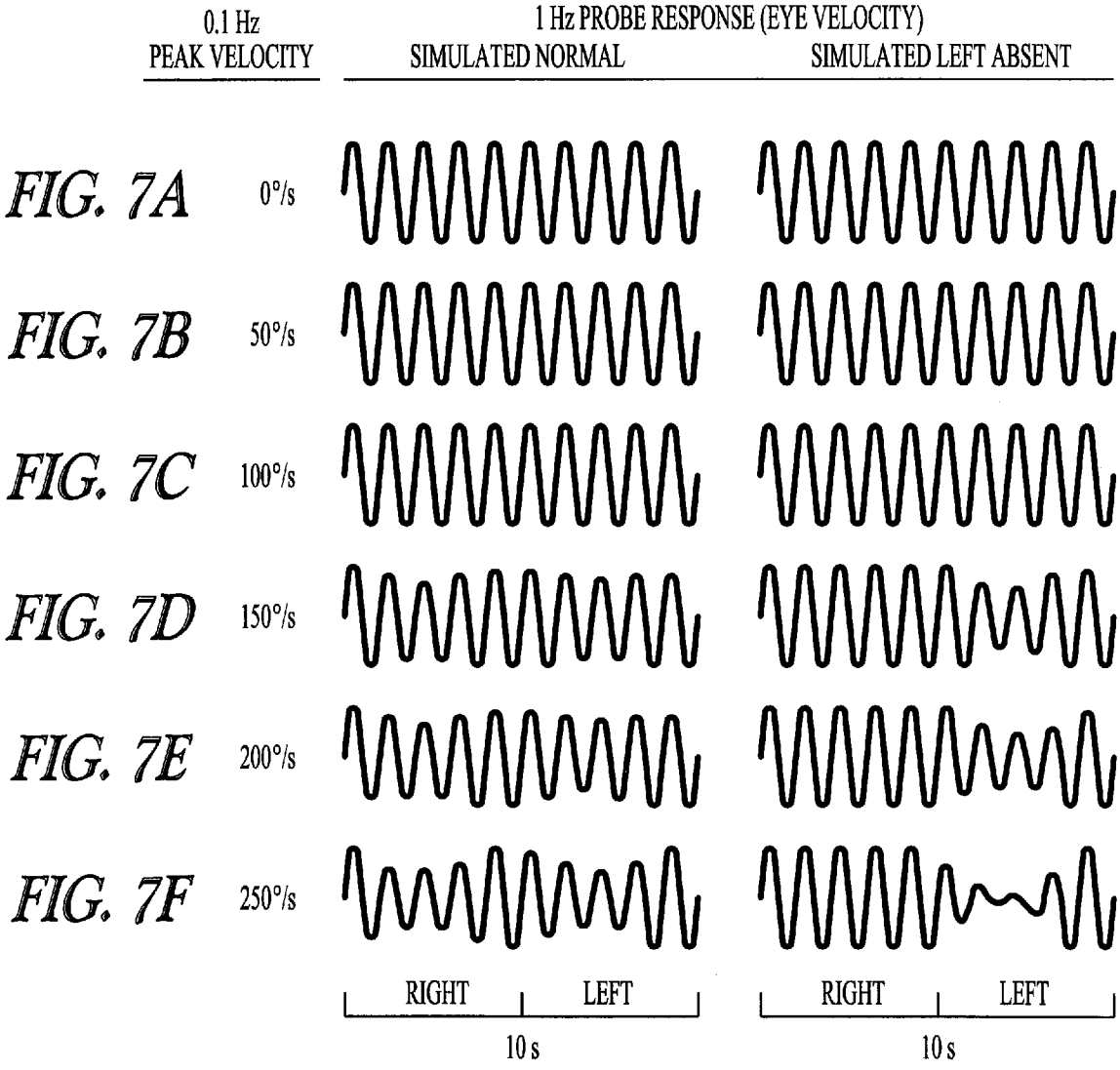

500
4s / 5s+1
L EAR1
90
L OFF1
SUM 5
L SATURATE1
.25
L GAIN1
2.24s / 5s+1
L EAR2
90
L OFF2
SUM 4
L SATURATE2
.5
L GAIN2
SUM 6
L OUT
520
[t,stim]
STIMULUS
1
SLIDER GAIN
s / 5s+1
L EAR3
90
L OFF3
SUM
L SATURATE3
.25
L GAIN3
INVERT
-1
510
VOR
SUM 2
0.5
GAIN 1
0 / 5s+1
R EAR1
90
R OFF1
SUM 1
R SATURATE1
.25
R GAIN1
0 / 5s+1
R EAR2
90
R OFF2
SUM 7
R SATURATE2
.5
R GAIN2
SUM 9
R OUT
0 / 5s+1
R EAR3
90
R OFF3
SUM 8
R SATURATE3
.25
R GAIN3

FIG. 5


0.1 Hz
PEAK VELOCITY
VOR RESPONSE (EYE VELOCITY)
SIMULATED NORMAL
SIMULATED LEFT ABSENT
FIG. 6A
0°/s
FIG. 6B
50°/s
FIG. 6C
100°/s
FIG. 6D
150°/s
FIG. 6E
200°/s
FIG. 6F
250°/s
DIRECTION OF
HEAD ROTATION
RIGHT
LEFT
RIGHT
LEFT
10 s
10 s


0.1 Hz
PEAK VELOCITY
1 Hz PROBE RESPONSE (EYE VELOCITY)
SIMULATED NORMAL
SIMULATED LEFT ABSENT
FIG. 7A
0°/s
FIG. 7B
50°/s
FIG. 7C
100°/s
FIG. 7D
150°/s
FIG. 7E
200°/s
FIG. 7F
250°/s
RIGHT
LEFT
RIGHT
LEFT
10 s
10 s

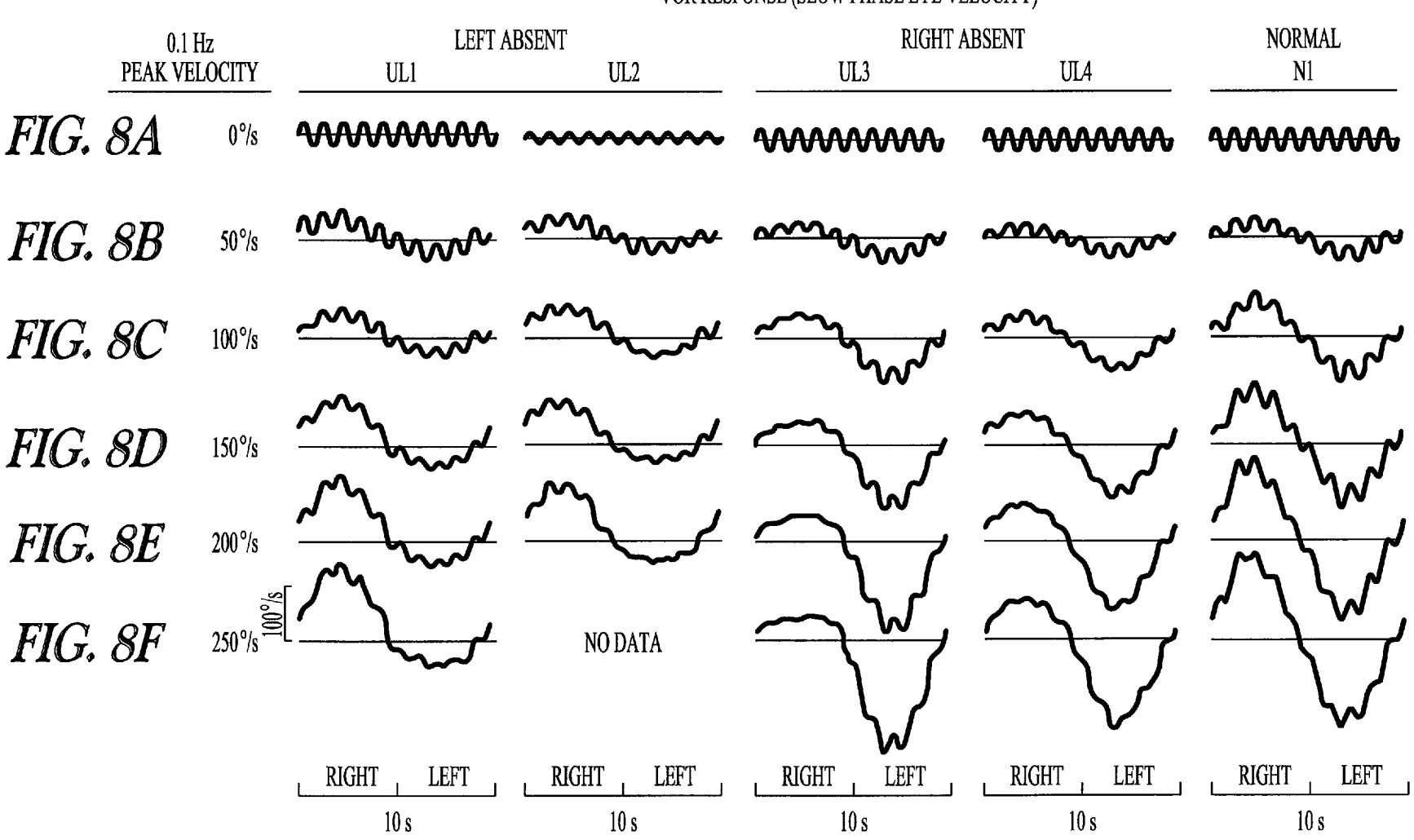

VOR RESPONSE (SLOW PHASE EYE VELOCITY)
0.1 Hz PEAK VELOCITY
LEFT ABSENT
RIGHT ABSENT
NORMAL
UL1
UL2
UL3
UL4
N1
FIG. 8A
0°/s
FIG. 8B
50°/s
FIG. 8C
100°/s
FIG. 8D
150°/s
FIG. 8E
200°/s
FIG. 8F
250°/s
100°/s
NO DATA
RIGHT
LEFT
10 s

FIG. 9A

FIG. 9B

FIG. 9C

FIG. 9D

FIG. 9E

FIG. 9F

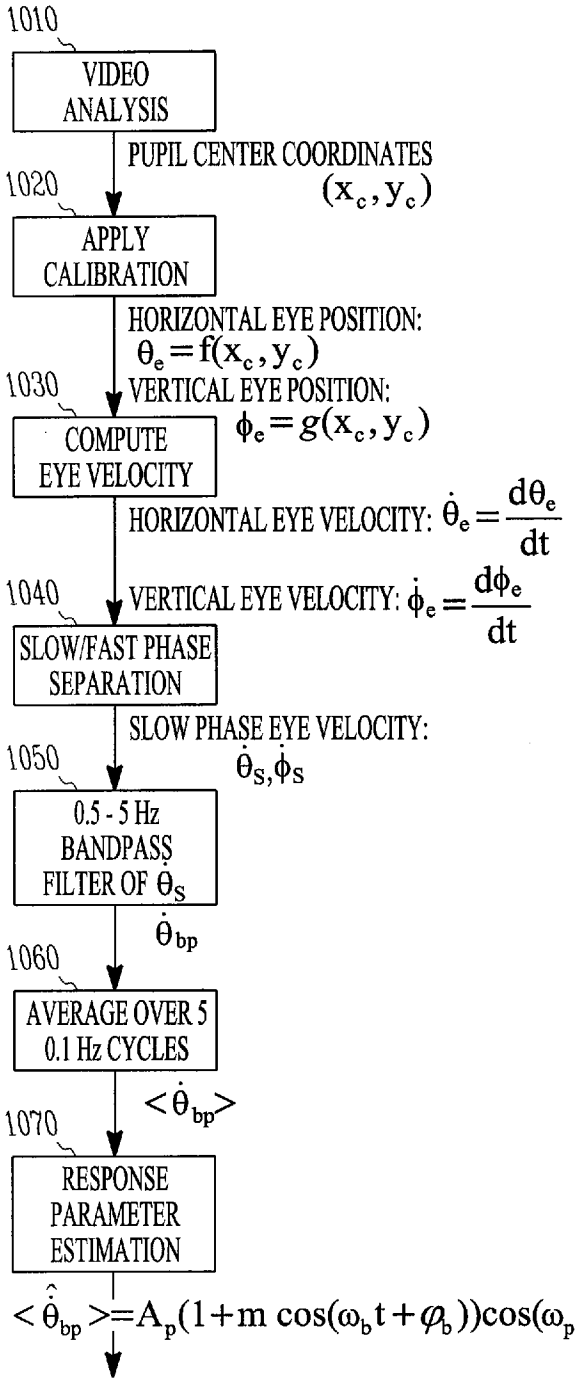


FIG. 10A

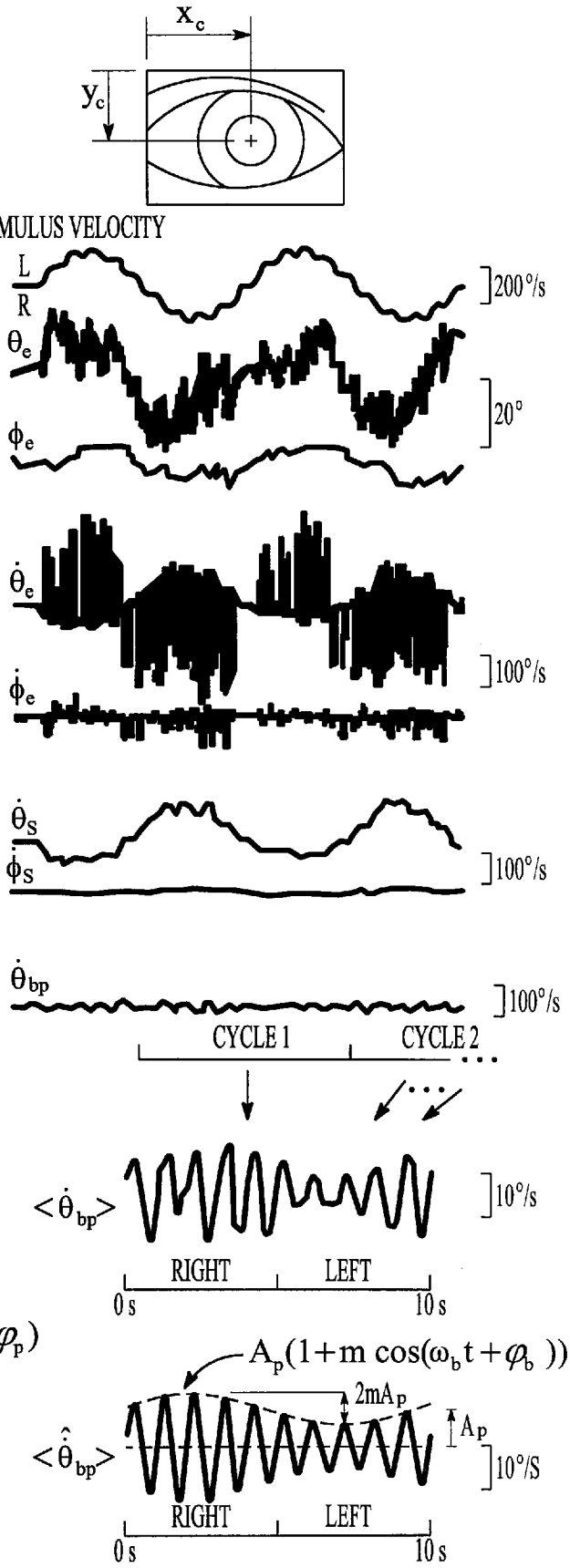


FIG. 10B

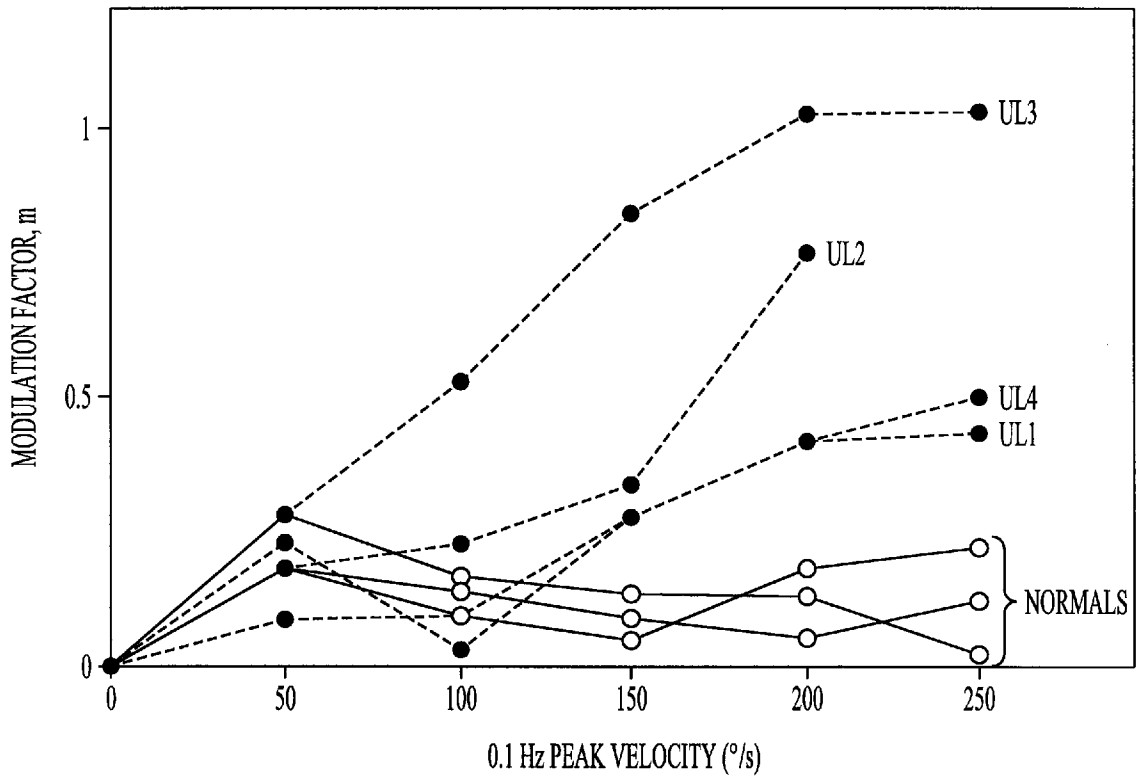

MODULATION FACTOR, m
1
0.5
0
0
50
100
150
200
250
0.1 Hz PEAK VELOCITY (°/s)
UL3
UL2
UL4
UL1
NORMALS

FIG. 11

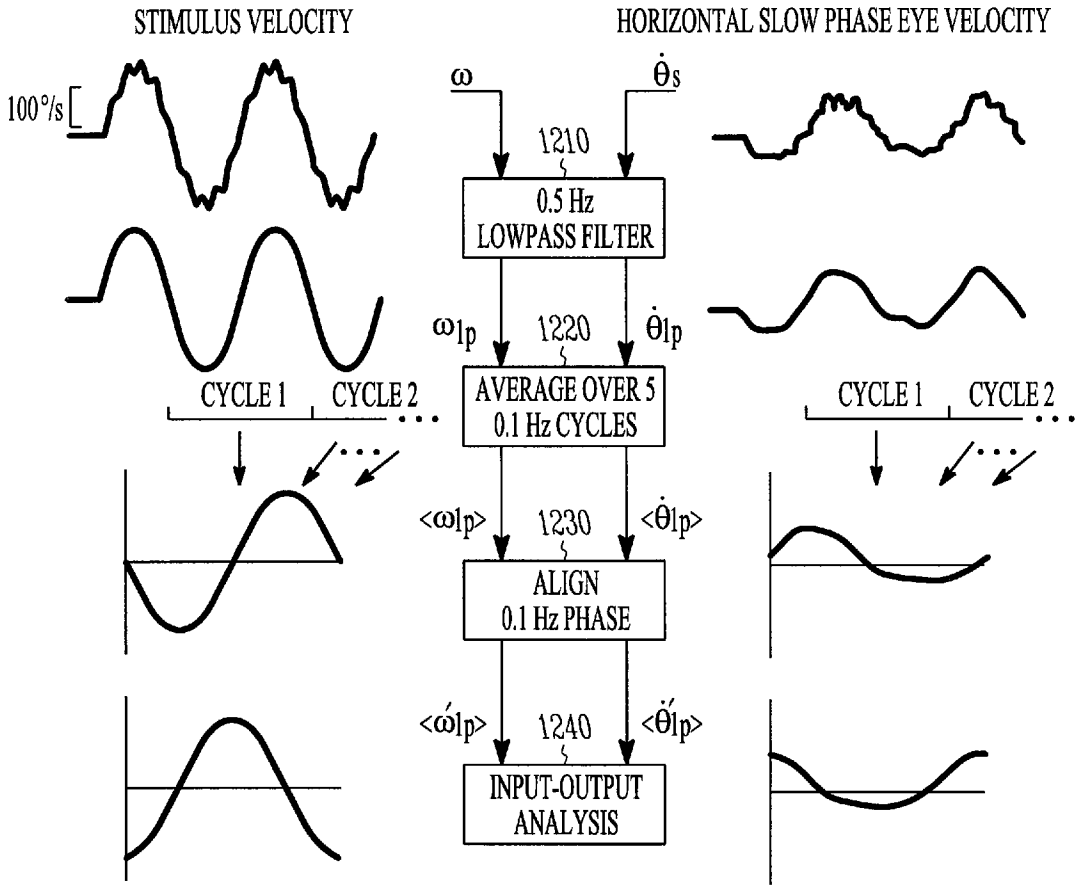

STIMULUS VELOCITY
HORIZONTAL SLOW PHASE EYE VELOCITY
100°/s
ω
θ̇s
1210
0.5 Hz
LOWPASS FILTER
ω1p
1220
θ̇1p
AVERAGE OVER 5
0.1 Hz CYCLES
CYCLE 1
CYCLE 2
<ω1p>
1230
<θ̇1p>
ALIGN
0.1 Hz PHASE
<ώ1p>
1240
<θ́1p>
INPUT-OUTPUT
ANALYSIS

FIG. 12

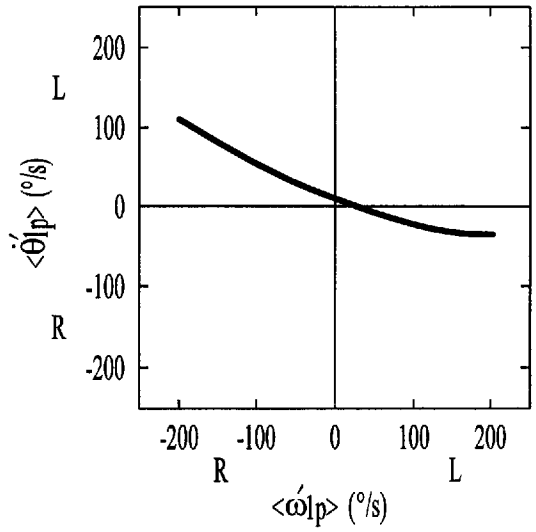

200
L
100
0
-100
R
-200
<θ̈1p> (°/s)
-200
-100
0
100
200
R
L
<ώ1p> (°/s)

FIG. 13

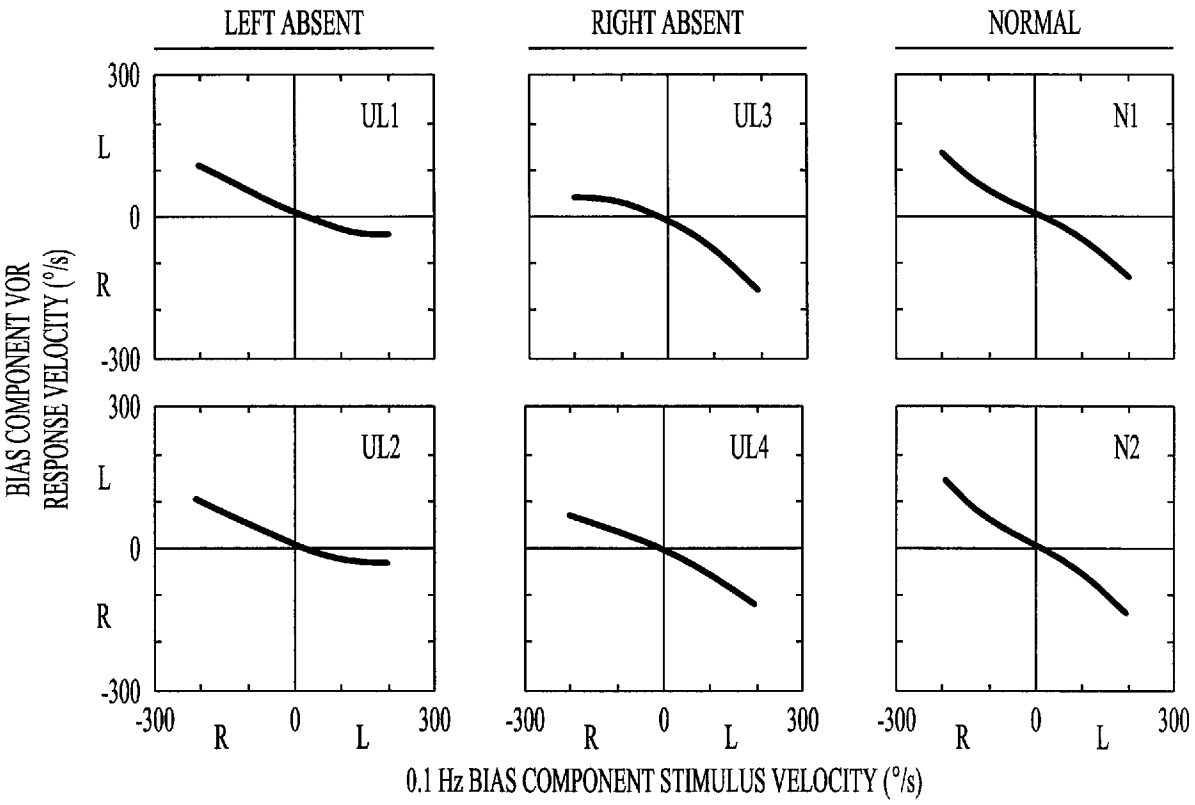

LEFT ABSENT
RIGHT ABSENT
NORMAL
UL1
UL3
N1
UL2
UL4
N2
300
L
0
R
-300
BIAS COMPONENT VOR RESPONSE VELOCITY (°/s)
0.1 Hz BIAS COMPONENT STIMULUS VELOCITY (°/s)

FIG. 14

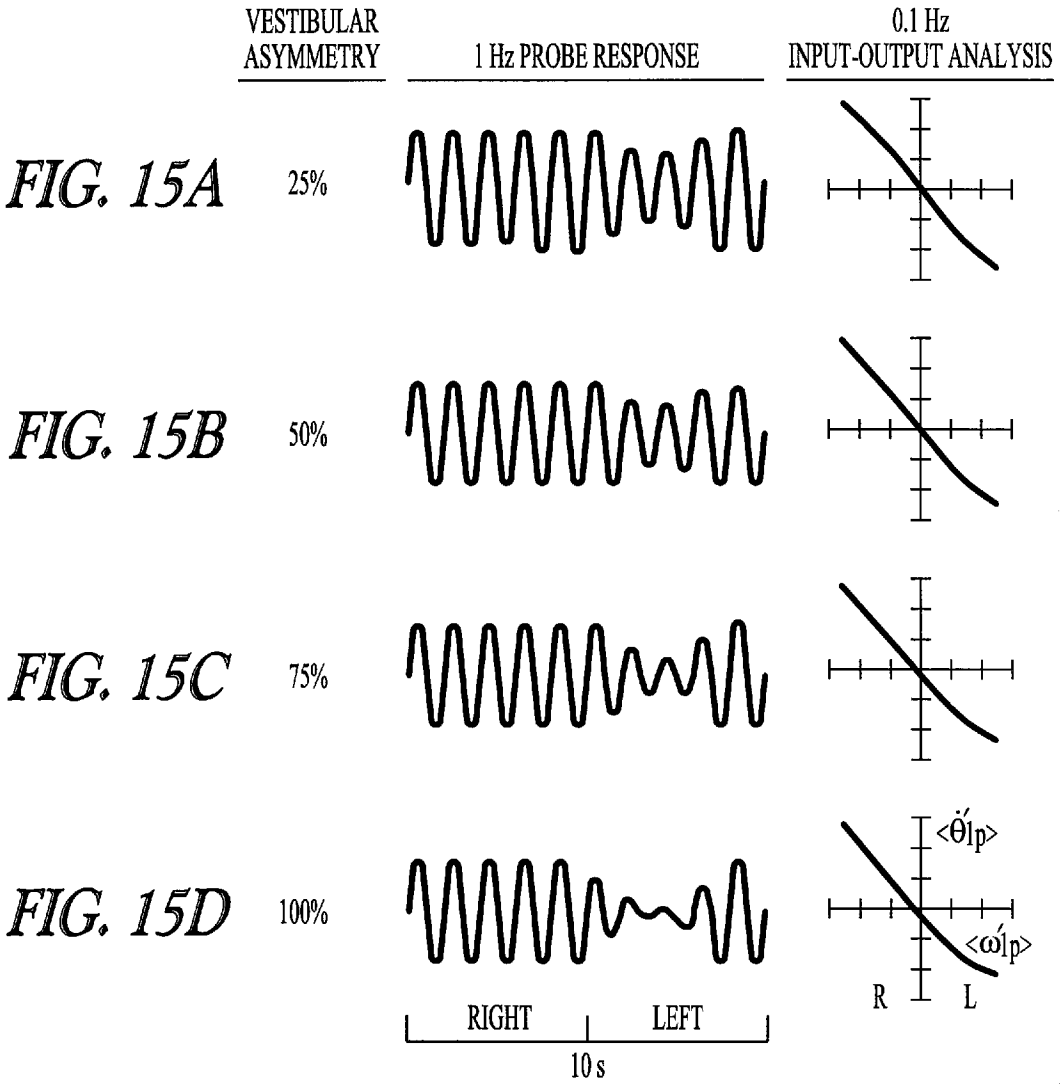

VESTIBULAR ASYMMETRY
1 Hz PROBE RESPONSE
0.1 Hz INPUT-OUTPUT ANALYSIS
FIG. 15A
25%
FIG. 15B
50%
FIG. 15C
75%
FIG. 15D
100%
RIGHT
LEFT
10 s
<θ̈lp>
<ω̇lp>
R
L

FIG. 16A

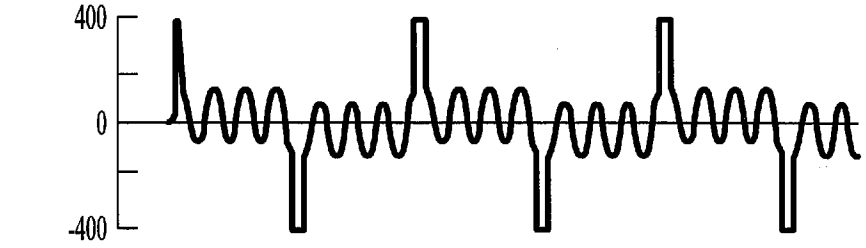


FIG. 16B

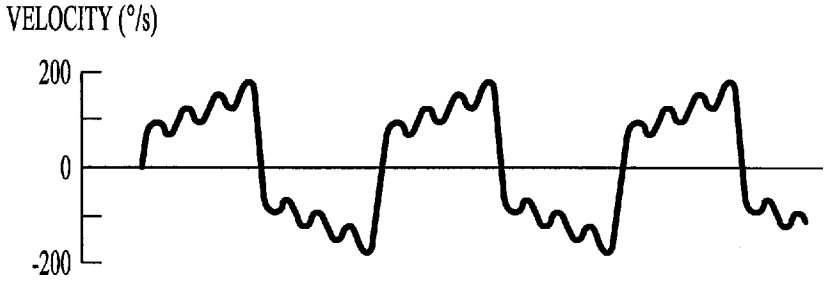
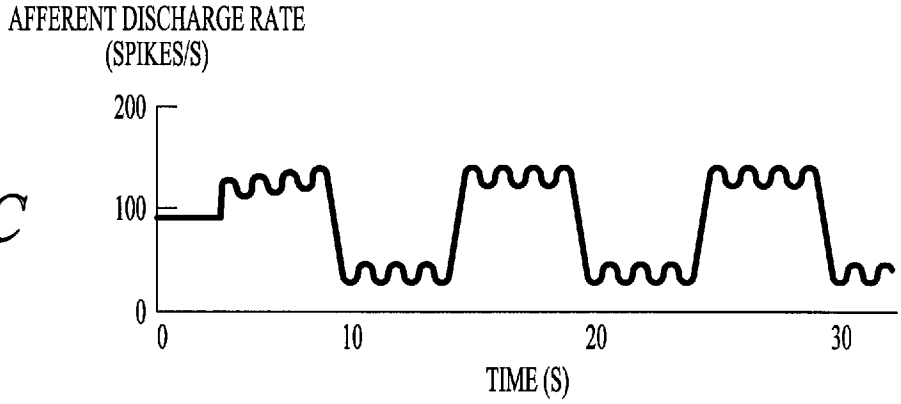
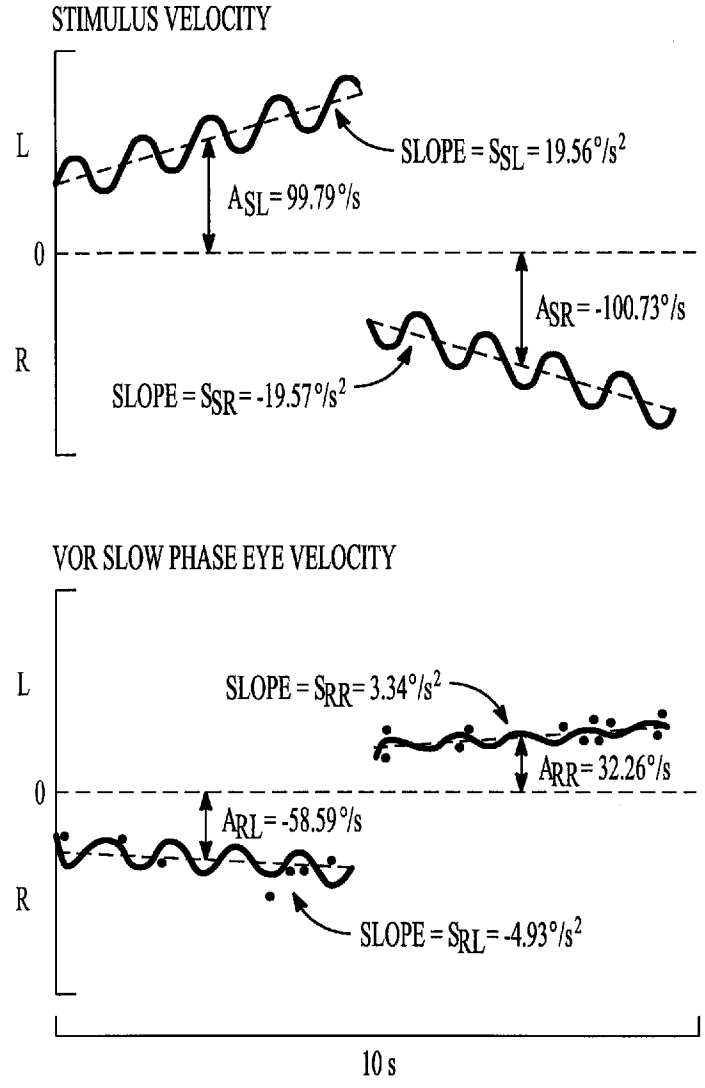


FIG. 16C



STEP COMPONENT MEASURES



$$\text{STEP ASYMMETRY} = \frac{\frac{A_{RL}}{A_{SL}} - \frac{A_{RR}}{A_{SR}}}{\frac{A_{RL}}{A_{SL}} + \frac{A_{RR}}{A_{SR}}} \times 100$$

(+) SIGN = DECREASED RESPONSE TO RIGHTWARD ROTATION

(-) SIGN = DECREASED RESPONSE TO LEFTWARD ROTATION

MEAN RESPONSE SLOPE = $(S_{RR} - S_{RL})/2$

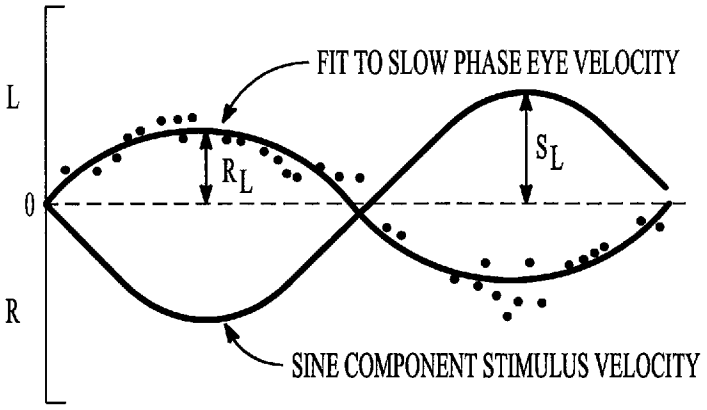
MEAN SLOPE IS REALATED TO THE VOR TIME CONSTANT

SLOPE > 0: TIME CONSTANT > 5s
SLOPE = 0: TIME CONSTANT = 5s
SLOPE < 0: TIME CONSTANT < 5s

FIG. 17A

SINE COMPONENT MEASURES

SINE RESPONSE DURING LEFTWARD STEP



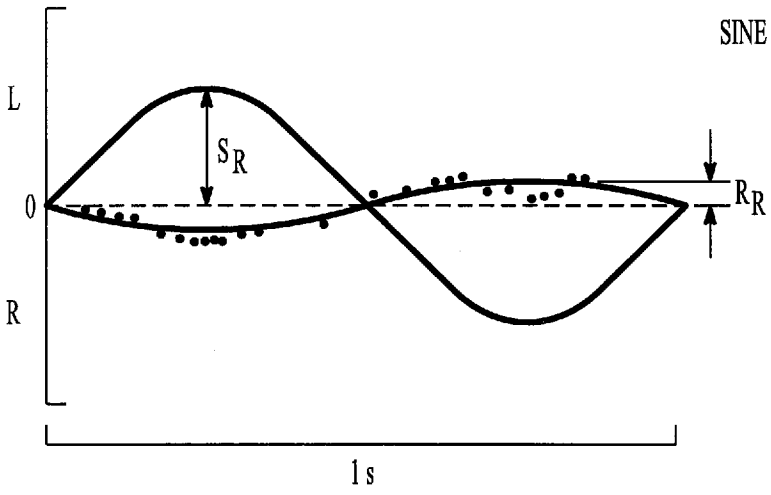
SINE COMPONENT GAIN DURING LEFTWARD STEP

$$VOR_L = \frac{R_L}{S_L}$$

SINE COMPONENT GAIN DURING RIGHTWARD STEP

$$VOR_R = \frac{R_R}{S_R}$$

SINE RESPONSE DURING RIGHTWARD STEP



SINE COMPONENT GAIN ASYMMETRY

$$= \frac{VOR_L - VOR_R}{VOR_L + VOR_R} \times 100$$

(+) SIGN = DECREASED RESPONSE TO RIGHTWARD ROTATION

(-) SIGN = DECREASED RESPONSE TO LEFTWARD ROTATION

FIG. 17B

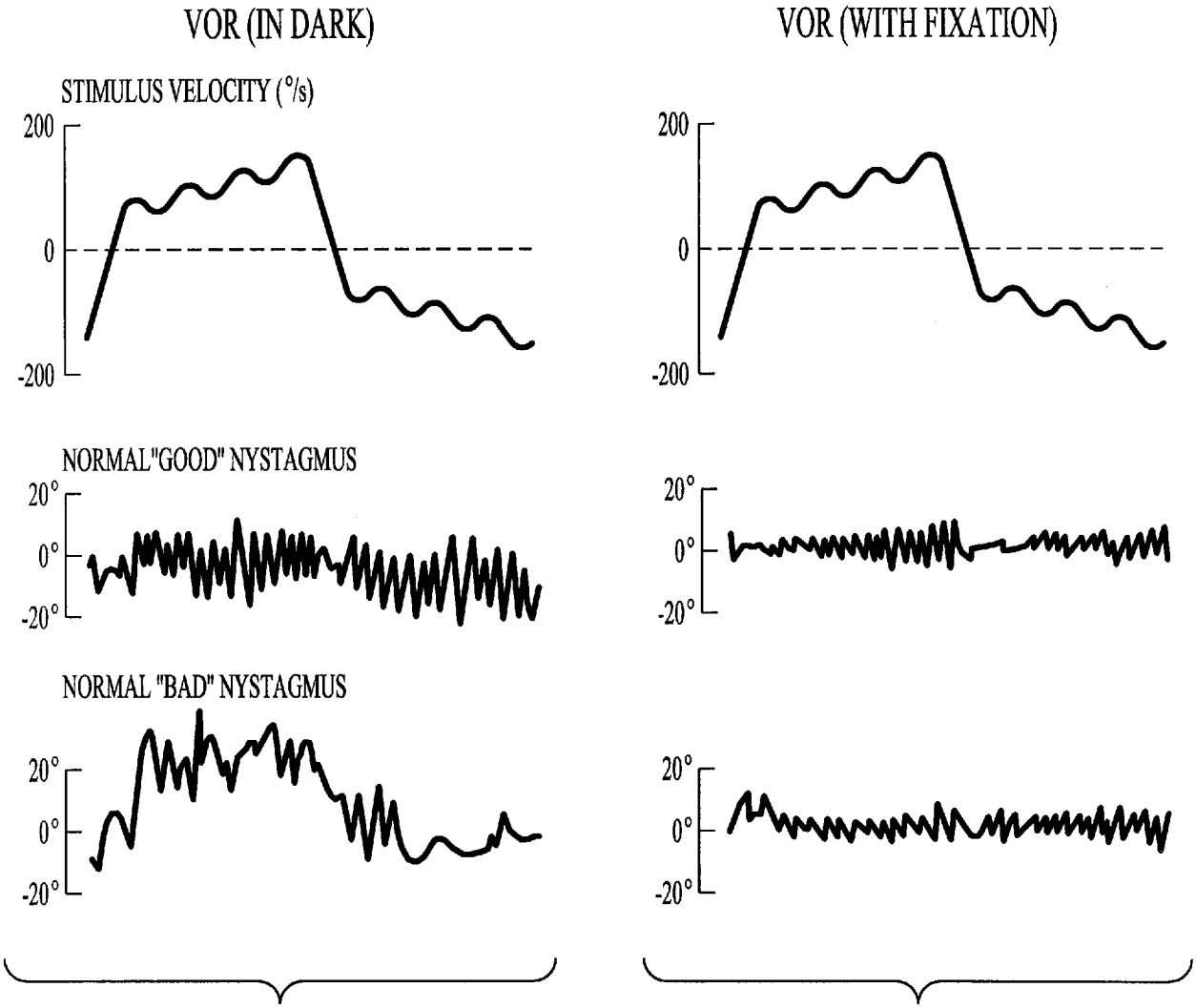


FIG. 18A

FIG. 18B

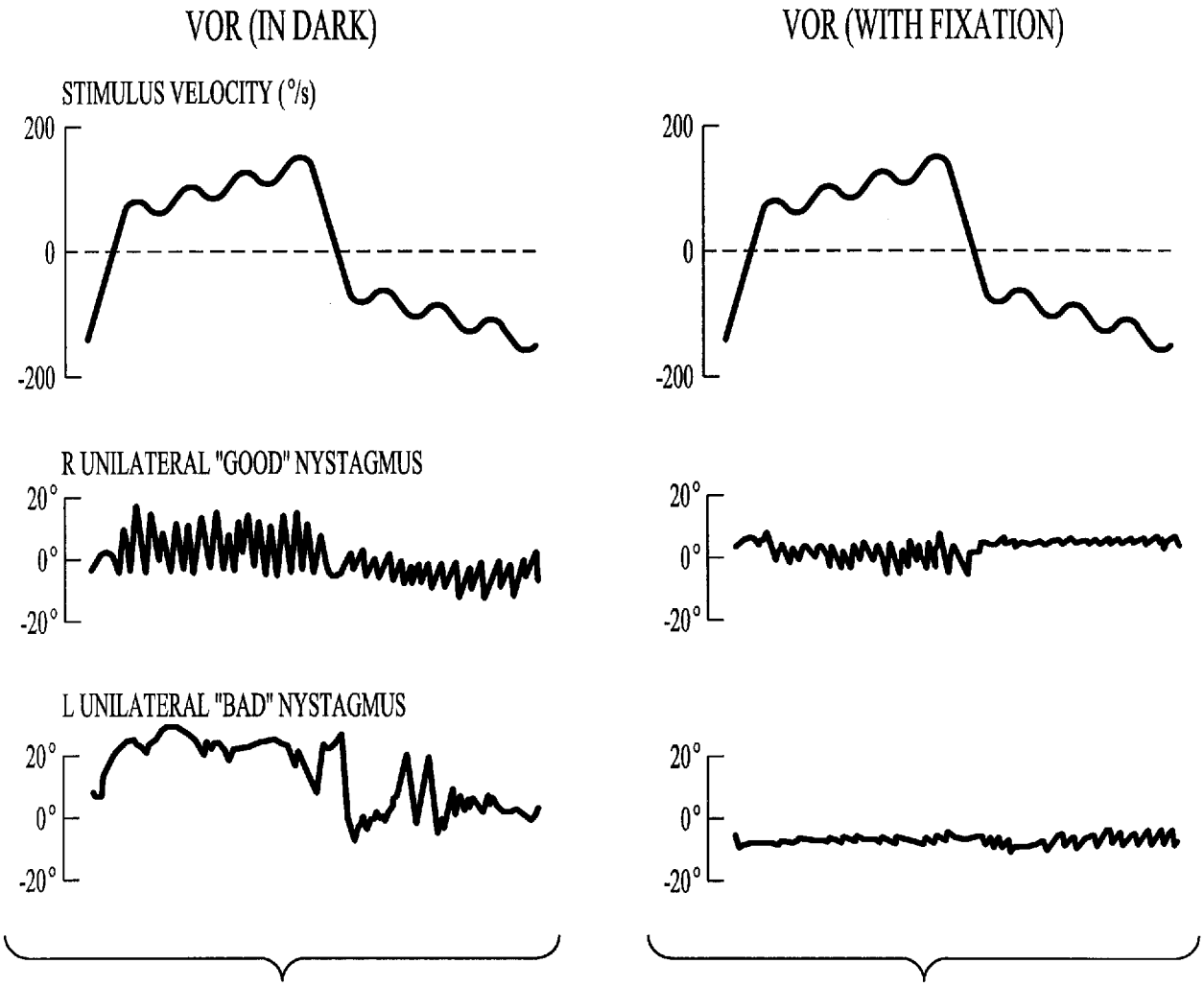


FIG. 19A

FIG. 19B

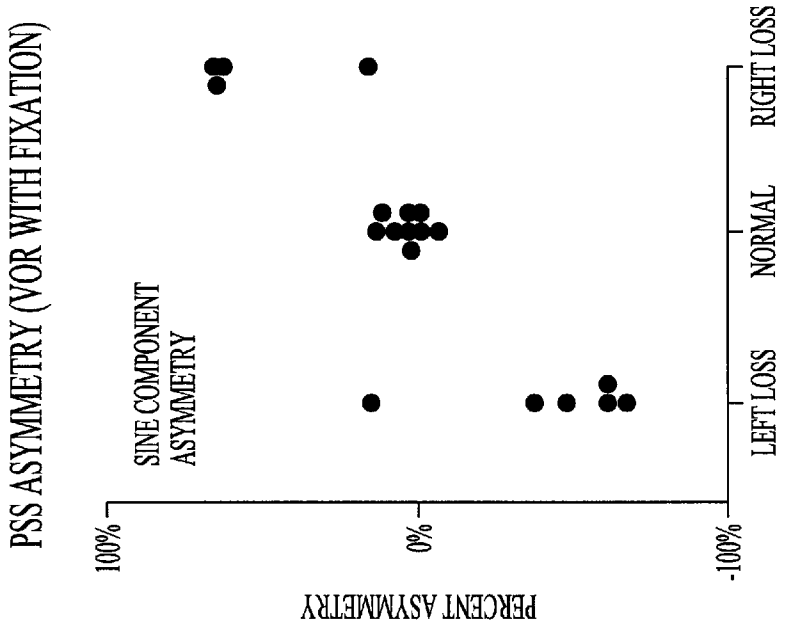


FIG. 20B

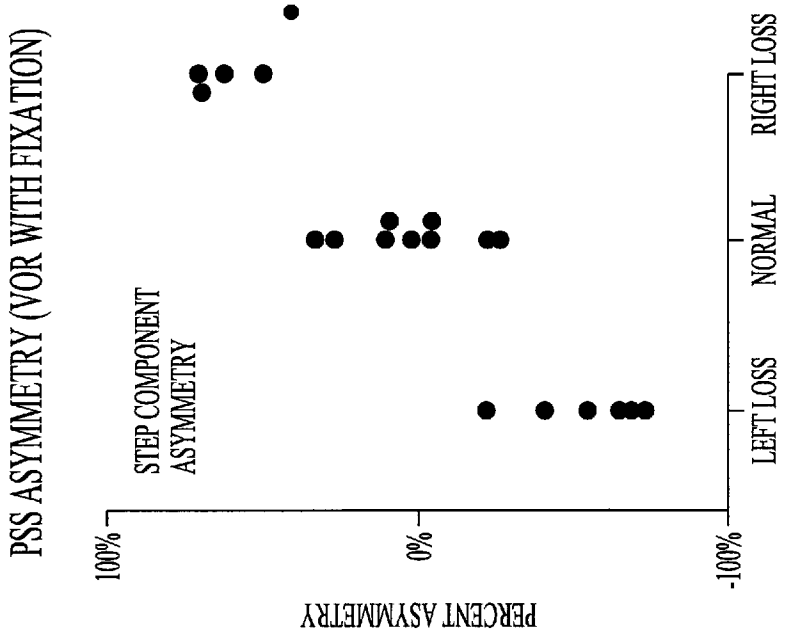


FIG. 20A